

LA-UR-16-21840

Approved for public release; distribution is unlimited.

Title:	Control of Delta Robot and Development of Servo Hook using Python Programming
Author(s):	Bae, Dae-Yun Mascarenas, David Dennis Lee
Intended for:	Presentation at departmental seminars at LANL and LANL-CNU Engineering Institute, Korea
Issued:	2016-03-17

Disclaimer:

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

Control of Delta Robot and Development of Servo Hook using Python Programming

Dae-Yun Bae¹, David Mascarenas²

Mar. 10th, 2016

¹ LANL-CBNU Engineering Institute Korea, Chonbuk National University, ² The Engineering Institute, Los Alamos National Laboratory, Los Alamos, New Mexico, USA

Contents



1 Shape Memory Alloy

2 String Tower

3 Delta Robot

4 Servo Hook

5 Conclusion

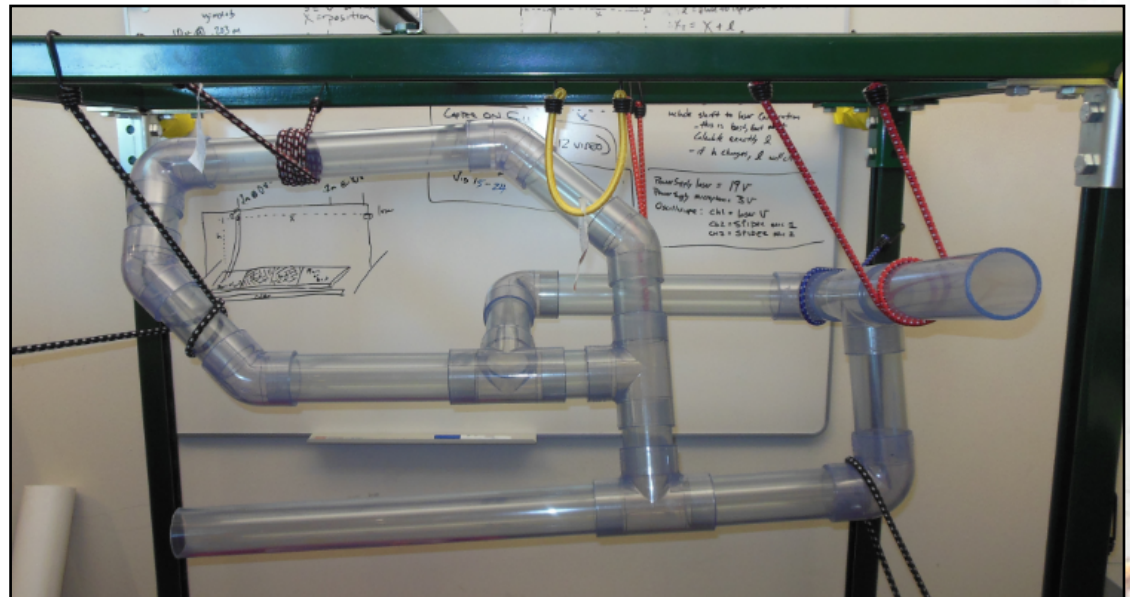
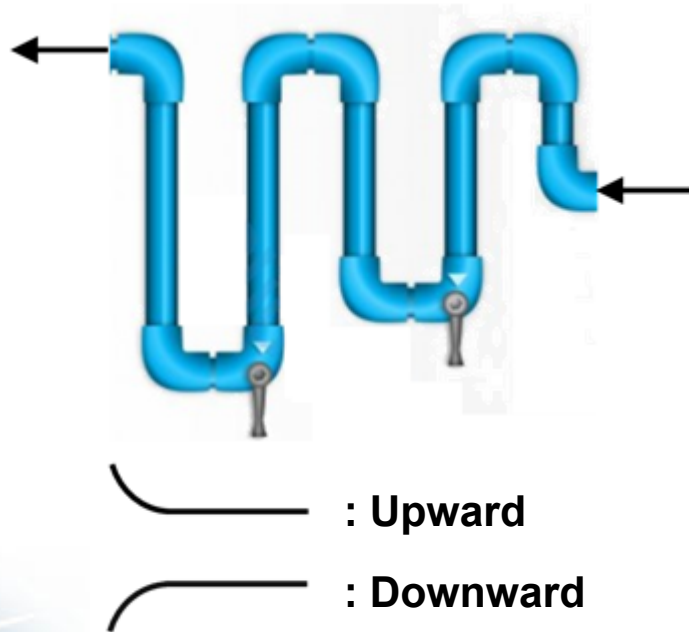


1. Shape Memory Alloy



Why do we need a shape memory alloy?

- To detect the locations of damage in a narrow pipeline using a shape memory alloy (SMA) equipped with tiny camera.
- SMA is an alloy that "remembers" its original shape and that when deformed returns to its pre-deformed shape when heated. (Heat control: PWM)



< Concept of damage detection using a SMA >

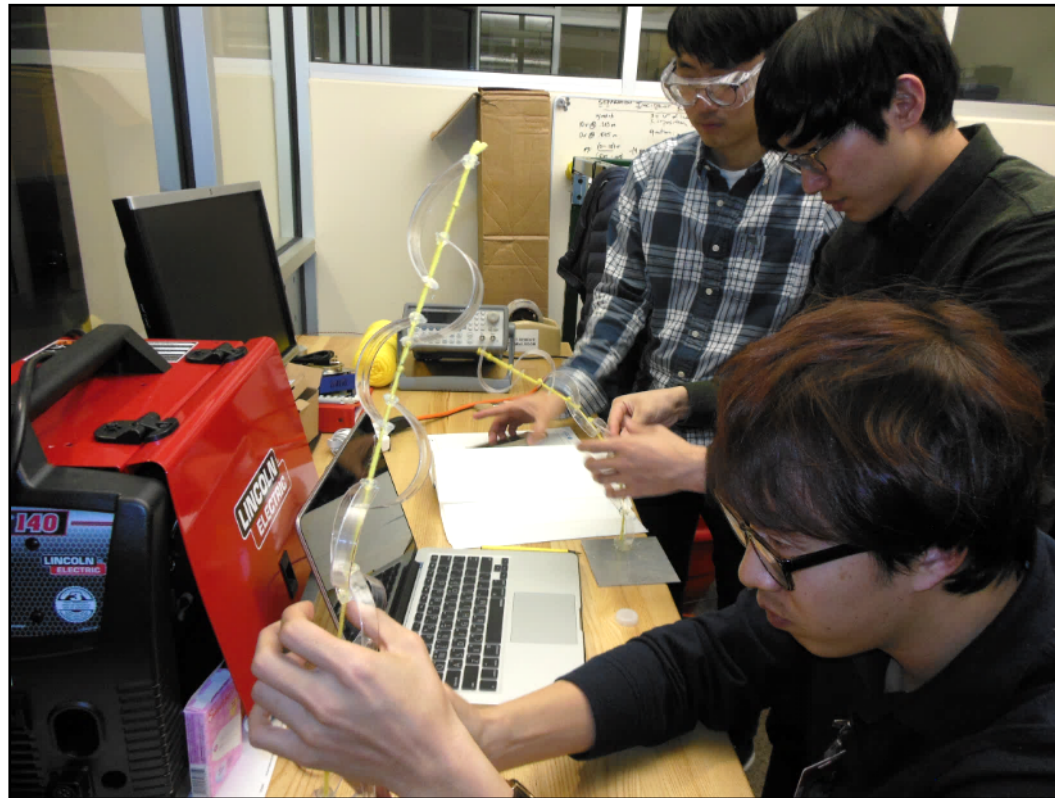
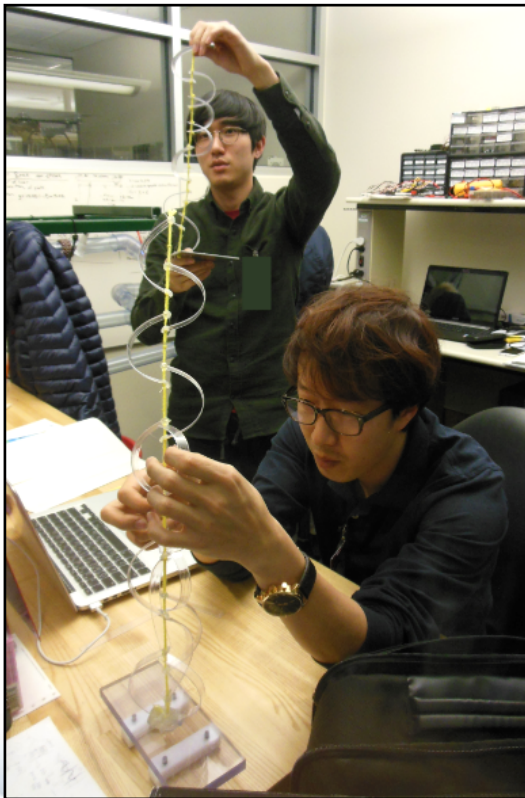
< Narrow pipeline >

2. String Tower

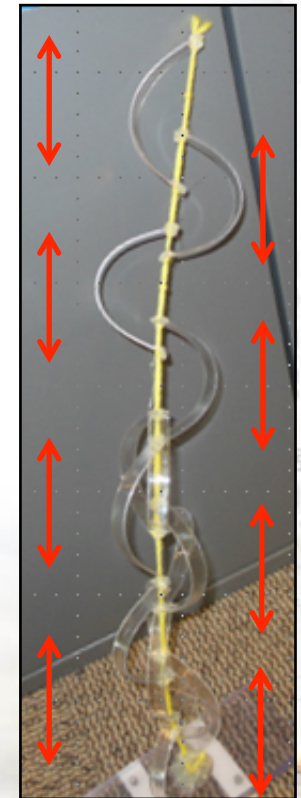


Why did we make a string tower?

- To understand about tension.
- A string tower is being held up by constant tension.



< Making the string tower >

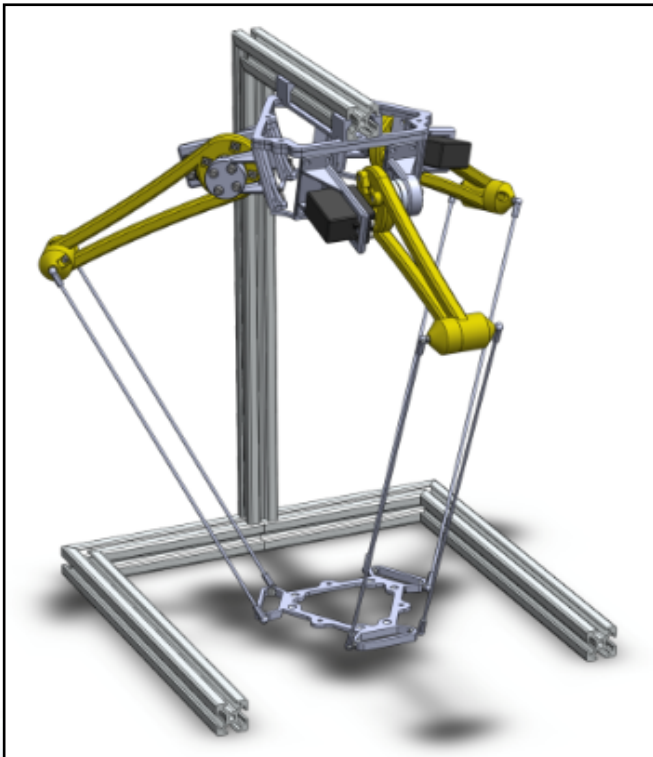


< String tower >

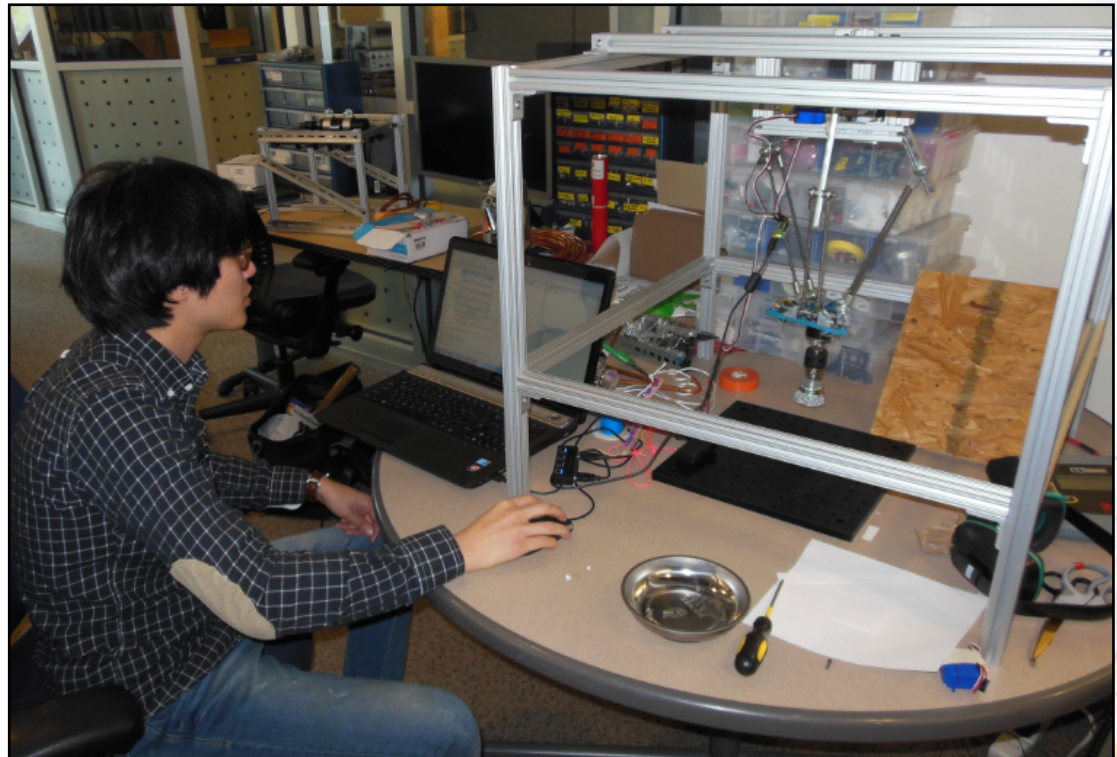
3. Delta Robot

Delta Robot Kinematics

- Control the Delta robot with the Pololu Micro Maestro 6-Channel USB Servo Controller.
- Python code, serial communication, GUI.



< Schematic of the Delta robot
(courtesy
to <https://noahctodd.wordpress.com>) >



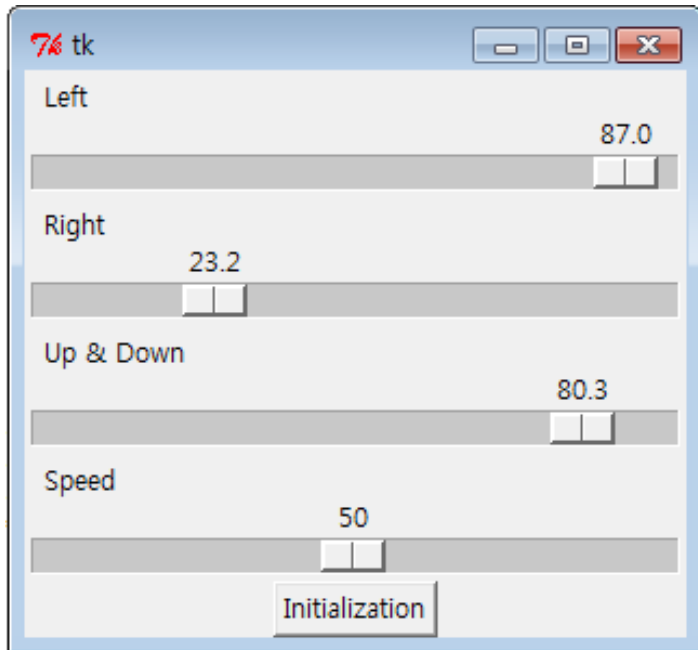
< Control of the Delta robot >

3. Delta Robot

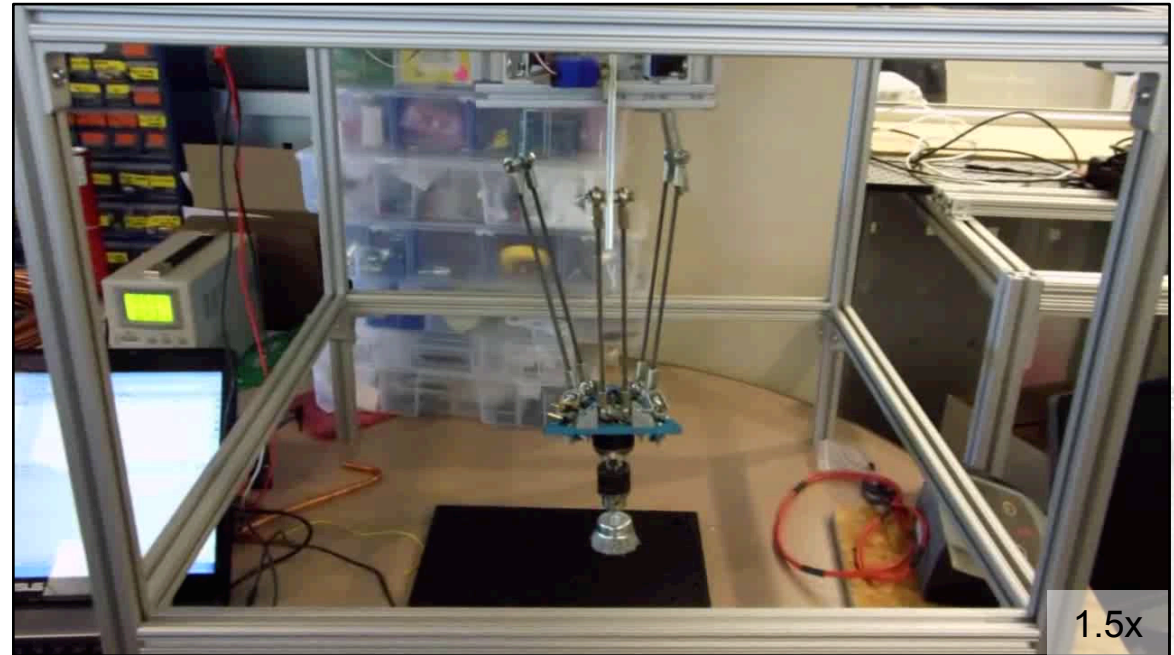


Delta Robot Kinematics

- Control the Delta robot with the Pololu Micro Maestro 6-Channel USB Servo Controller.
- Python code, serial communication, GUI.



< GUI for controlling the Delta robot >

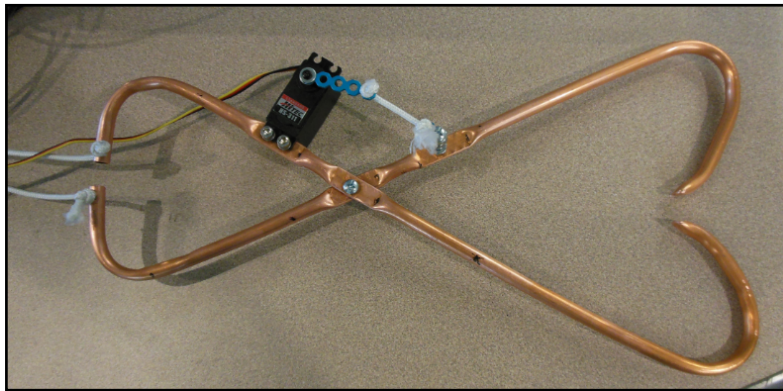


< Control of the Delta robot >

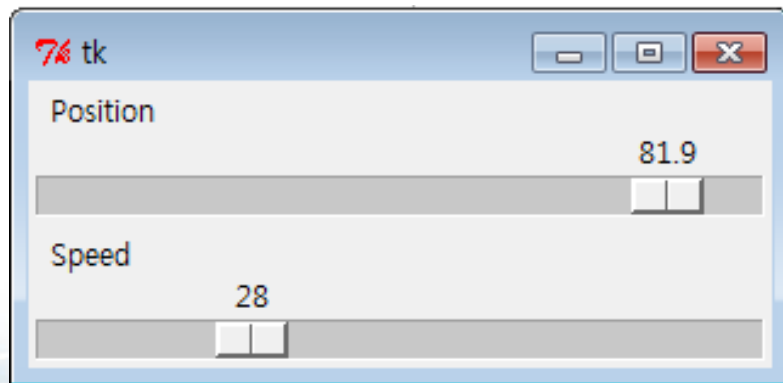
4. Servo Hook

Servo Hook

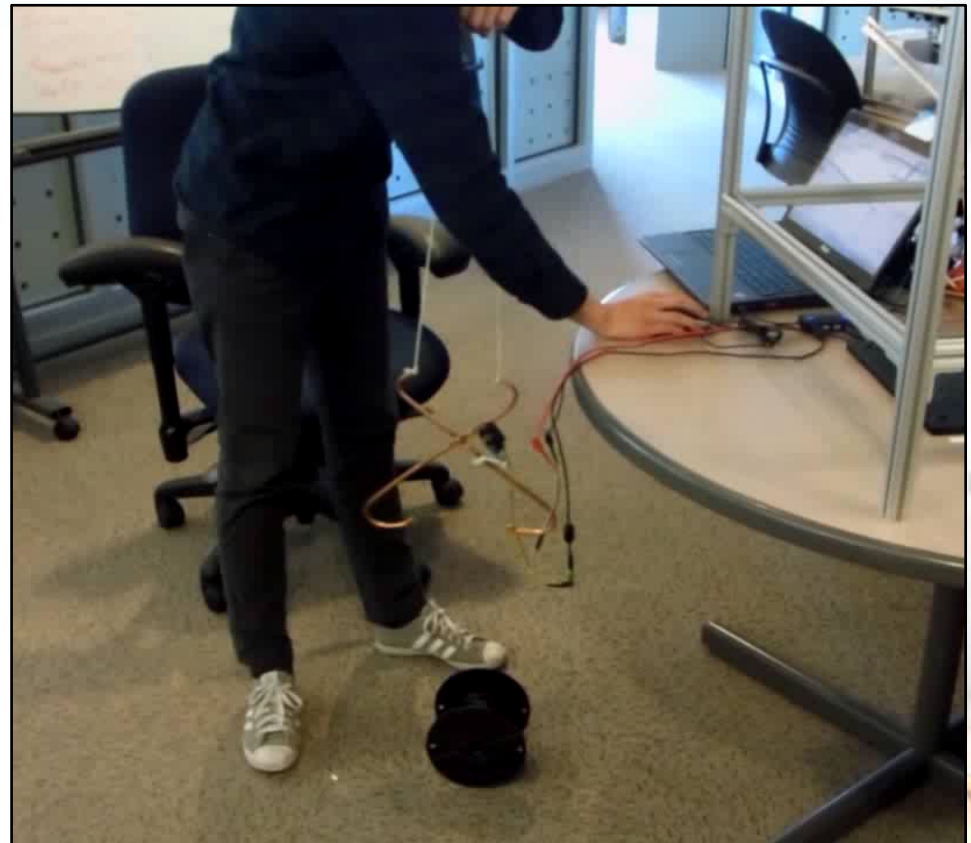
- To pick up something like a eagle's foot.
- Python code, serial communication, GUI, servo motor, thread.



< Servo hook >



< GUI for controlling the Servo hook >



< Control of the Servo hook >

4. Servo Hook

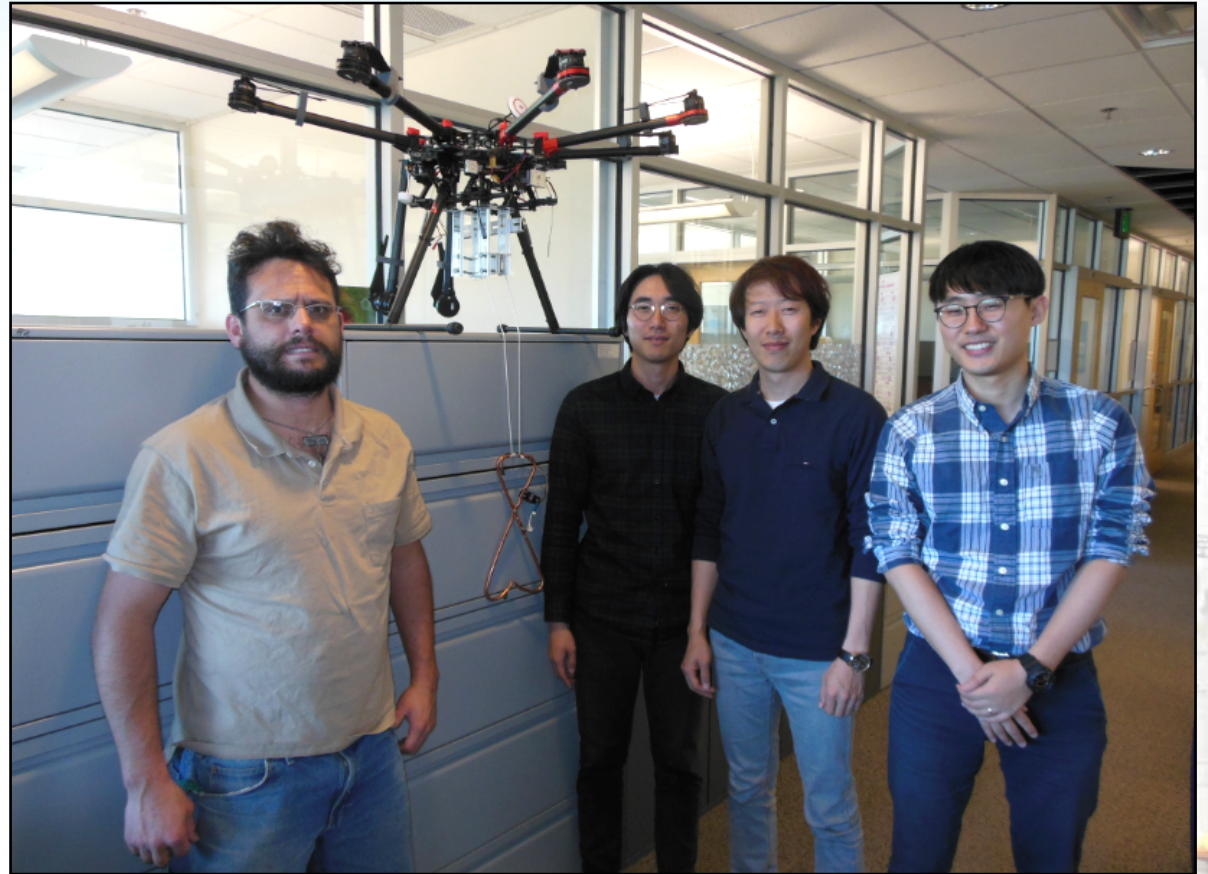


Servo Hook

- Installation for drone to pick up something like a eagle's foot.



< Drone with Servo hook >

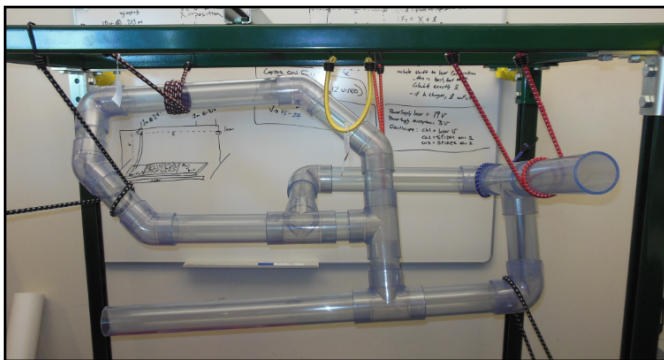


< Group picture with Servo hook-installed drone >

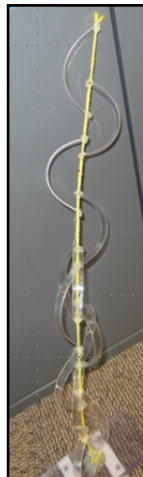
5. Conclusion

Summary

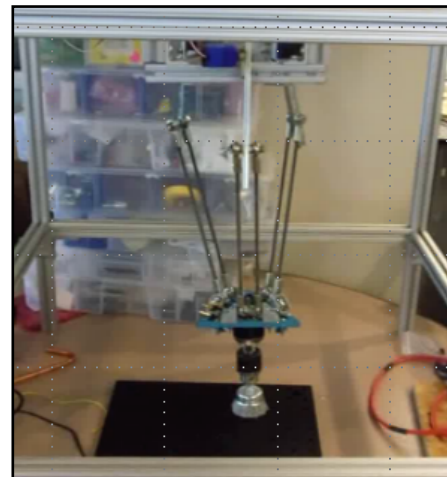
- Construction the narrow pipeline for damage detection inside it with SMA.
- Development of the string tower.
- Control of Delta robot using Python serial communication and GUI.
- Development of the Servo hook-installed drone.



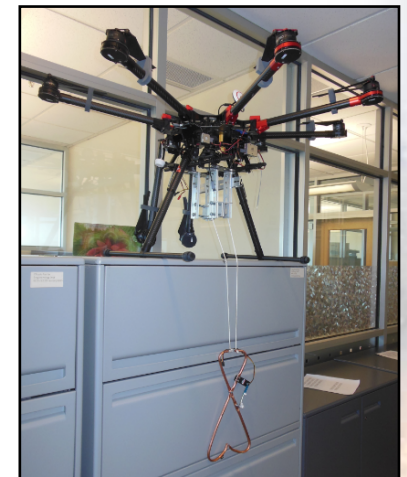
< Narrow pipeline >



< String tower >



< Control of the Delta robot >



< Drone with Servo hook >